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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte STUART J. KNOWLES and ROBERT H. MOORE

Appeal 2008-0533
Application 09/615,294
Technology Center 3700

Decided: May 19, 2008

Before: TERRY J. OWENS, JENNIFER D. BAHR and STEVEN D.A. McCARTHY, *Administrative Patent Judges*.

McCARTHY, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

The Appellants appeal under 35 U.S.C. § 134 (2002) from the final rejection of claims 4-8 and 10-18 under 35 U.S.C. § 102(b) (2002) as being anticipated by Macy (U.S. Patent 5,522,249) or, in the alternative, under 35

U.S.C. § 103(a) (2002) as being unpatentable over Macy. We have jurisdiction under 35 U.S.C. § 6(b) (2002).

We REVERSE.

The claims on appeal relate to methods for manufacturing tuning forks. A preferred method manufactures a double-ended tuning fork including a piece of piezoelectric material having a central body, a pair of drive tines extending from one end of the central body and a pair of pickup tines extending from the other end of the central body. (Spec. 4, ll. 3-9). A tuning fork of this design may be used to sense a rate of rotation about an axis of symmetry of the tines by driving the drive tines to oscillate in a plane containing the axis of symmetry and then measuring electrical signals induced by Coriolis stresses appearing in the material as the fork rotates. (Spec. 1, ll. 4-13).

Small variations in the fabrication of the tuning fork may cause the tines to oscillate asymmetrically, giving rise to an electrical error signal referred to as a "quadrature error signal" because it is 90º out of phase with the signal induced by the Coriolis stresses in the fork. (Spec. 1, l. 14 – 2, l. 2). The present specification asserts that a "conventional" method for reducing this quadrature error signal is to deposit masses on the ends of a pair of tines and then use a laser to remove a portion of the mass from one of the tines. The specification states that the removal of mass from the end of a tine subjects the tine to a torsional twist giving rise to a signal which may be used to negate the quadrature error signal. (Spec. 2, ll. 3-11). One drawback to this conventional method is that an imbalance between the masses at the ends of a pair of tines may result in unwanted vibration of the tuning fork as a whole as well as its surroundings. (Spec. 2, ll. 12-20).

As will become more apparent during the course of this opinion, the primary issue in this appeal is whether Macy discloses or teaches maintaining a balance in mass between the tines. Macy discloses a single-ended tuning fork inertial sensor including a tuning fork formed of a single piece of piezoelectric material chemically etched to form a body integral with a single pair of tines. (Macy, col. 1, ll. 7-8 and col. 2, l. 51 – col. 3, l. 1). Drive electrodes and pickup electrodes are mounted on the surfaces of the tines. (Macy, col. 3, ll. 41-42). Drive signals applied to the drive electrodes cause the tines to oscillate in opposite directions. (Macy, col. 6, ll. 26-36). The pickup electrodes detect "pickup signals" which may be processed to obtain a DC voltage indicative of the rate of rotation of the tuning fork about an axis of symmetry of the tines. (Macy, col. 6, ll. 37-61).

Claim 4 recites a method of manufacturing a tuning fork including the step of "using balancing masses on the front surface of one tine and the rear surface of the other tine to reduce quadrature displacement." Even assuming for purposes of this appeal that Macy's drive and pickup electrodes are "masses" within the meaning of claim 4, we agree with the Appellants (App. Br. 5) that Macy's electrodes are not used to maintain a balance in mass between the tines.

Macy discloses mounting and trimming the electrodes of a single-ended tuning fork so that the electrodes are "physically balanced to facilitate separation of the pickup signals from the drive signals." (Macy, col. 2, ll. 33-36). The reference suggests that mounting and trimming the electrodes to approximate physical symmetry on the tines reduces error in the desired rate signal by reducing residual charges on the pickup electrodes which represent the drive strains. (Macy, col. 7, ll. 18-25). We agree with the

Appellants that one need not maintain a balance in mass between the tines when mounting or trimming the electrodes to reduce these residual charges.

Macy would not have provided one of ordinary skill in the art reason to maintain a balance in mass between the tines. The reference does not teach or suggest any relationship between the masses of the electrodes and the magnitude of error in the desired rate signal. Moreover, the reference does not disclose preferred masses for the electrodes or suggest mounting electrodes having masses sufficient to significantly affect the motions of the tines. We agree with the Appellants (Appeal Br. 5 and 8) to the extent that Macy's teachings do not convince us that one of ordinary skill in the art would use electrodes on the front surface of one tine of Macy's tuning fork and on the rear surface of the other tine to maintain a balance in mass between the tines. On the record before us, the Appellants have shown that the Examiner erred in rejecting independent claim 4 under section 102(b) as well as alternatively under section 103(a).

Claim 5 recites "removing portions of the mass elements from the front surface of one tine and from the rear surface of the other to reduce quadrature displacement in the tines and maintain a balance in mass between the tines." Claim 11 recites "trimming the balancing masses on opposite sides of the drive tines to reduce quadrature displacement without affecting mass between the drive tines." Claim 14 recites "removing substantially equal amounts of the balancing masses from the front surface of one of the tines and from the rear surface of the other tine to reduce quadrature displacement in the tines and maintain the balance in mass between tines." Claim 16 recites "removing substantially equal amounts of the balancing masses from the front surface of one of the drive tines and from the rear

surface of the other drive tine to reduce quadrature displacement in the drive tines and maintain a balance in mass between them."

With respect to these claims, as with respect to claim 4, we agree with the Appellants (*e.g.*, Reply Br. 1) that Macy does not disclose maintaining a balance of mass between the tines and that the reference would have provided one of ordinary skill in the art no reason to maintain such a balance. On the record before us, the Appellants have shown that the Examiner erred in rejecting independent claims 5, 11, 14 and 16 under section 102(b) as well as alternatively under section 103(a). Since claims 12 and 13 depend from claim 11; claim 15 depends from claim 14; and claims 17 and 18 depend from claim 16, the Appellants have shown that the Examiner also erred in rejecting those claims under section 102(b) as well as alternatively under section 103(a). *In re Fritsch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992).

Claim 6 recites "adding mass elements to the front surface of one tine and the rear surface of the other tine to eliminate[1] quadrature displacement in the tines and maintain a balance in mass between the tines." Once again,

[1] We note that Appellants amended claim 6 to substitute the word "reduce" for the word "eliminate" in an Amendment entered May 17, 2004. Claim 6 was reproduced with the final clause as shown in the text of this opinion in three subsequently-entered Amendments filed August 17, 2004; March 17, 2005; and June 24, 2005 as well as in the claims appendix of the Brief on Appeal. We would reach the same result in this appeal were the word "reduce" substituted for the word "eliminate."

we agree with the Appellants (App. Br. 5 and 9) that Macy does not teach or suggest the addition of mass elements to maintain a balance in mass between the tines. On the record before us, the Appellants have shown that the Examiner erred in rejecting independent claim 6 under section 102(b) as well as alternatively under section 103(a).

Finally, claim 7 recites "adjusting the balancing masses on opposite sides of the two tines to reduce quadrature displacement in the tines and maintain a balance in mass between the tines." We agree with the Appellants (App. Br. 6 and 9) that Macy does not show or suggest adjusting the balancing masses to maintain a balance in mass between the tines. On the record before us, the Appellants have shown that the Examiner erred in rejecting claim 7 under section 102(b) as well as alternatively under section 103(a). Since claims 8 and 10 depend from claim 7, the Appellants have shown that the Examiner also erred in rejecting those claims under section 102(b) as well as alternatively under section 103(a). *Fritsch*, 972 F.2d at 1266.

Summarizing the conclusions which we draw from the record before us, the Appellants have shown that the Examiner erred in rejecting claims 4-8 and 10-18 under section 102(b) as being anticipated by Macy or, in the alternative, under section 103(a) as being unpatentable over Macy.

DECISION

We reverse the Examiner's rejection of claims 4-8 and 10-18.

REVERSED

jlb

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